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Support Top Management Decision Making: GSS for Strategic Issues

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ABSTRACT

In the information systems literature, there is contention that managers, especially top managers, do not use information technology for strategic planning and decision making. Why is this so? This paper examines the strategic decision making process as described in the literature of strategic management, organization theory, and psychology. From these descriptions, I show why managers shun traditional information systems for strategic decision making. Then, based on these descriptions, a support system is proposed that would better answer the needs of the strategic decision making process. The system is intended to support top management teams, rather than individual decision makers in a vacuum. Some propositions for researching various issues associated with design and use of the system also are presented.

1. INTRODUCTION

Ever since the field-defining work of Leavitt and Whisler (1958), information system researchers as well as practitioners have felt that the power of the computer to efficiently handle large amounts of information could be brought to bear on business problems other than accounting. However, despite the many studies and articles extolling the virtues of information technology and its potential contributions to the organization (see Attewell and Rule, 1984, for a review), widespread availability and use of such technology to perform internal strategic functions still appears to be lacking (Wallace, 1989).

Numerous reasons have been put forward as to why strategic-level information system applications have not become commonplace. Some popular reasons are cyberphobia (fear of computers), lack of requisite skills (keyboarding, operating systems and applications usage, etc.), a chauvinistic attitude toward the use of machines, lack of knowledge about available technology, and the simple availability of suitable software to support the executive's work.

Availability is an acute problem. Perhaps the most familiar observation is that no one has specifically defined and described a strategic application in sufficient detail or to the satisfaction of a majority of the information systems community, such that actual systems could be developed. Despite comprehensive studies describing what managers really do (e.g., Mintzberg, 1973), there is still confusion as to the nature of a strategic information system or executive support system (Rockart and DeLong, 1988, p. 14). The notion that computer-based information systems would cause heavier centralization of decision making in organizations (Leavitt and Whisler, 1958) has added to the confusion in designing systems to support executives.

Attempts have been made to present top managers with aggregated transactional or accounting information for their detailed analysis. Studies show that such applications clearly do not answer the needs of executives at the strategic level (Dearden, 1983; Mintzberg, 1973, pp. 149-152). Managers more likely rely on their subordinates to filter such data and make decisions in accordance with their roles in the organization (Klatzky, 1970); managers do not want more detailed information, but rather only that information which bears directly on strategic decisions at hand (Wildavsky, 1983).

In a detailed study of executives, Mintzberg (1973, pp. 35-48, 65-77) observed that they made little use of information technology, relying instead on "soft" information that could only be gleaned through personal contacts and digestion of qualitative data. Though that study was based on a small sample and was carried out at a time when information technology was generally limited to the production of "hard" accounting information, more recent work has supported Mintzberg's finding (Rockart and DeLong, 1988, pp. 1-3).

So executives in general do not seem to make use of information technology in their work. But Huber (1984a) and Drucker (1988) see post-industrial organizations making more use of information technology to support the executive function. Huber predicts that by providing more reliable "hard" data in a more efficient manner, information technology will free executives to make more personal contacts and thus glean more "soft" information. Drucker believes that technology will replace Wildavsky's (1983) organizational filter, and thus drastically flatten the organization, while facilitating a widened span of control through more efficient intraorganizational communications. Rockart and DeLong (1988) use the positive views of the future "information-based organization" (Drucker, 1988) to build a case for strong potential value in the use of information technology to support top management. Although Rockart and DeLong's descriptions of an executive support system cover interesting facets of strategic support, they are incomplete. It is this author's view that executives will continue to avoid the use of technology based on the traditional information systems approach. Such systems only provide digests of transactional or accounting information. No matter how timely or comprehensive such information may be, it is of little use to executives, since their search for information concentrates on the "soft" variety. Rather, a richer system that is responsive to the requirements of

top management is needed -- one that satisfies the executive's need for time-sensitive, "trigger" information (Mintzberg, 1973, p. 149).

Further, top managers do not make decisions in a vacuum. A top management team typically works in tandem to make strategic decisions (Shrivastava and Grant, 1985). Thus the ideal information system for support of strategic decision making must necessarily support a group decision process, paralleling the design of the organization itself (Huber, 1984b; Huber and McDaniel, 1986; Wynne, 1989; Wynne and Heminger, 1990).

For that reason, in this paper I will seek to clarify the design of a strategic support system -- an integrated system that supports the strategic function in an organization. I will ground this design in an understanding of the strategy formation (Mintzberg, 1978) process and its incremental nature (Lindblom, 1965; Quinn, 1980). I will also account for the organizational support structure for the strategy function (Huber and McDaniel, 1986; Shrivastava and Grant, 1985).

The paper will proceed by first outlining leading theories in the fields of strategic management, organization theory, judgment and decision making psychology, and information systems dealing with group decision making at the strategic level. Based on an analysis of those theories, a few ideas on the design of a strategic support system will be synthesized. Then, I will frame some new research opportunities based on this synthesized view of support for the strategic decision making process.

2. THEORETICAL FRAMES

2.1 The Strategic Decision Making Process

When we think of organizing from the standpoint of decision making, it can be seen that "organization" implies restriction of communication among members to reduce the level of chaos that otherwise would ensue during the decision making process (Katz and Kahn, 1978, pp. 430-431). Thus when we think of a well-organized firm, we picture a formal communication structure that conveys information among members in a manner that is conducive to careful planning and decision making.

This view of organization design has been called the "decision-making paradigm" (Huber and McDaniel, 1986). This paradigm is distinguished by the idea that decision making is becoming the central activity in some organizations. Thus the most important consideration in designing the organization is the facilitation of decisions. There is a tendency toward more complex environments, which require more decisions at an accelerating rate (Huber, 1984a). Coupled with the great degree of importance placed on decisions, greater stress will be placed on the creation of organization structures that allow decentralized decision making. While decentralized decisions will be made within various areas of expertise, top management wants to retain an integrated overview that affords control over the organization (Lawrence and Lorsch, 1967).

In the context of the strategic management function, decision making is not just the central activity; it is the *only* activity. Thus it is especially germane that consideration be given to the structuring of the top management team for decision making effectiveness. But to do this, an understanding of the various models of strategic decision making is required.

Four models of strategic decision making have been supported in empirical research (Table 1) (Shrivastava and Grant, 1985). Two of these are artifacts of the design of the organizations, and the remaining two are reflections of human behavior in organizations. In the descriptions that follow, the typology is that of Shrivastava and Grant (1985).

Table 1
Strategic Decision Making Models

Model	Traits
Managerial autocracy	Highly centralized
Systemic bureaucracy	SOPs; Official rules
Political expediency	Mutual adjustment
Adaptive planning	Logical incrementalism

The *managerial autocracy* model is primarily evident in young, entrepreneurial organizations, where a single person maintains complete control in a simple structure (Mintzberg, 1979; Shrivastava and Grant, 1985). If other organizational members are involved in decision making, their role is solely as sources of information.

In the *systemic bureaucracy* model, official rules and regulations dominate the development of alternatives and the final decisions (Shrivastava and Grant, 1985). This model is a direct parallel of the machine bureaucracy (Mintzberg, 1979) type of organization, which is guided almost entirely by standard procedures and formal rules.

In Mintzberg's (1979) adhocracy, the emphasis is on "mutual adjustment" of activities among essentially independent segments of the organization. The *political expediency* model, in which factions coalesce around specific alternatives that favor their own interests, fits this description of organizational behavior well. Shrivastava and Grant (1985) found that final decisions in this model were made through negotiations among the coalitions.

The predominant form of decision making found in Shrivastava and Grant's (1985) investigation proved to be the *adaptive planning* model, in which organizations constantly modify their strategic plans according to dictates of the current situation. Mintzberg (1979) associated this form with his professional bureaucracy organization. Extensive research has shown this form to be the prevalent style of decision making in complex organizations (Fredrickson, 1984; Fredrickson and Mitchell, 1984; Lindblom, 1965; Mintzberg, 1978; Mintzberg, et al., 1976; Quinn, 1980). As such, it deserves a closer look.

Lindblom (1965) argues that organizations seldom carry through with their original long-range plans, tending instead to make incremental adjustments in their activity based on current outcomes. In fact, he believes that in the face of such behavior, long-range planning is a waste of

time. Quinn (1980), however, supports the view that incrementalism is used to adjust long-range plans based on environmental conditions and the success or failure of the current plans, a process he termed "logical incrementalism." In this view, managers "test the water" before wholesale commitment, and alter their plans of action as feedback from implementation reaches them. This is quite different from the popular view of leaders making clear-cut decisions based on a rational, comprehensive analysis of the problem space, laying down concrete plans of action, and driving for their goals. Quinn ascribes goal-seeking behavior to the manager, but shows that the manager typically will not depend on a single means of reaching the goal.

Fredrickson (1984; Fredrickson and Mitchell, 1984) made a thorough investigation as to whether organizations followed a rational, synoptic model or a logical incremental model, finding in favor of Quinn's view. In two companion studies, Fredrickson presented strong support for environmental uncertainty as a root cause for logical incrementalism. If strategy formation is considered to be a pattern of decisions (Mintzberg, 1978) that define the incremental direction of the organization, then the stream of decision-making is the strategy formation process. As Mintzberg (1978) has shown, intended strategy is often side-tracked and replaced or combined with an emergent strategy composed of measures taken in reaction to changes in the environment (Figure 1). That the degree of comprehensiveness of the analysis supporting the process is related to environmental uncertainty is then a reasonable hypothesis. While it seems to be human nature to attempt to be more comprehensive in a more stable environment, the process is still not purely synoptic, as future events are not entirely predictable (Fredrickson, 1984; Johnson, 1988).

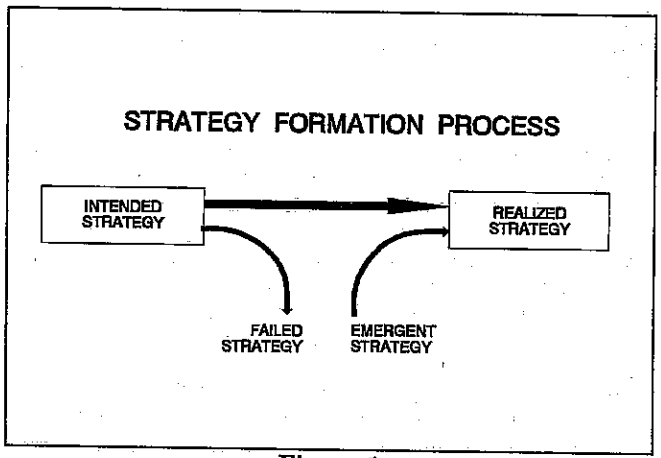

Figure 1

2.2 Psychological Aspects of Decision Making

One explanation for the lack of comprehensiveness in human judgment and decision making is the concept of bounded rationality (Simon, 1976). Since the cognitive capacity of the decision maker is limited, a large part of the information which bears directly on the decision to be made is ignored. Despite the fact that this information is not used in the decision making process, its existence falsely increases the decision maker's confidence in his or her judgment (Schwenk, 1986).

Other cognitive biases affecting decision making have been described elsewhere (Brehmer, 1986; Payne, 1982; Schwenk, 1986) and will not be covered here, as they are less pertinent to the examination of comprehensiveness. The degree to which cognitive bias comes into play is a function of the degree of structure of the problem requiring a decision. In a treatment of problem structure, Smith (1988) defines ill-structured problems as those for which the problem solver cannot readily surmise a method for finding a solution. In this light, the degree of structure is relative to the problem solver. The successful problem solver is the one who can structure the unstructured problem by breaking it down into familiar chunks (Mintzberg, et al., 1976) for which the problem solver has a ready solution method. So the problem definition or problem structuring process involves a sub-problem of finding the procedure that leads to a solution (Smith, 1988). Let's look at some of the proposed procedures for solving this sub-problem.

Hammond and his associates (1986) have proposed a method to bring a more rational approach to the process of making a judgment. They propose focusing the decision-making group's attention on key factors, each of which can be separately assigned a relative weight or value toward the final decision. Group members come to agreement on the key factors and their relative values, and the resulting function, similar to a multiple regression, provides a final decision. This approach has been particularly effective when emotionally-charged or politically controversial decisions must be made.

When a single person has responsibility for a decision, Lyles (1981) finds that problem definition follows a cyclical process between the individual problem solver and the organization. The problem solver (manager) seeks agreement with the organization over the existence of a problem and the manager's definition of the problem. She further proposes that more ill-structured problems require more political processes for organizational-level problem definition. Lyles reasons that the political cycling she describes in her studies leads to more accurate definition of the problem than could be achieved by a manager working alone.

Mintzberg believes that such cycling can leave the manager stuck in a loop. Because managers devote some 75% of their time to collecting information, there is no time to analyze the information before making a decision. But, the manager cannot delegate the analysis and decision-making because it is information-dependent and the manager has a monopoly on the information (Mintzberg, 1973, pp. 173-174). Thus even in the managerial autocracy model, there is still a need for sharing of information within a group to break the loop.

2.3 Information Systems for Decision Support

In response to the problem of bounded rationality, much attention has been given to the use of information technology to enhance the decision making process. Katz and Kahn (1978) considered casting problems in terms that could be attacked by a computer (pp. 494-496). The more popular approach has been to attempt the design of information systems which would aid in the structuring of problems for the decision maker. Such systems have come to be known as decision support systems (DSS).

In the design of DSS, the guiding ideas have come from management science researchers. The aim has been to develop DSS which extend rational decision making beyond human limitations. By providing the proper framework for modeling problem solutions, the DSS would then assist the decision maker in being more comprehensive by considering more information than was possible without a DSS (Henderson, 1987). But at what level does a DSS fit in the organization?

Wallace (1989) describes three levels of information systems. Transactional systems, the first level, comprise the bulk of traditional management information systems. They provide detailed tracking of a current database with regular updates fed into the database from business transactions. The second level is tactical systems, which make use of aggregated transactional information to support mid-level management decisions. The third level is strategic systems, which would be designed to support top managers.

There has been considerable success in developing tactical systems because of the large installed base of transactional systems from which aggregate information can be drawn to support tactical decisions. An excellent example is Lockheed-Georgia's Management Information and Decision Support (MIDS) system (Houdeshel and Watson, 1987). This family of systems is commonly referred to as executive information systems (EIS).

But at the strategic level, there is little to be gained by further diarization of transactional information (Wallace, 1989). Top managers seek information on competitors, consumers, and the environment in which their firm operates. In turning outward for their information, they do not ignore firm performance as reflected in transactions; but, they generally do rely on lower echelons to filter this information and provide what amounts to reports by exception (Wildavsky, 1983).

Of particular value for strategic support is the sharing of information among those top executives engaged in environmental scanning activities, whether they take part in actual decision making or not (Huber, 1984b). Techniques have been developed to facilitate the sharing of information and consensual decision making at the group level (Van de Ven, 1974). These techniques have been successfully supported through group support systems (GSS), also called group decision support systems or group organizing support systems (Wynne, 1990).

But there is an interesting phenomenon seen repeatedly in GSS research. The philosophy of GSS designers and researchers, just like the DSS researchers before them, is based in management science. The goal is to make the group's decision making process closer to optimum, to produce better decisions (DeSanctis and Gallupe, 1987). In experiment after experiment, GSS have been shown to provide such a result, but the group members are less satisfied with their objectively better decisions (Cats-Baril and Huber, 1987; DeSanctis, et al., 1989; Gallupe, DeSanctis, and Dickson, 1988; Gallupe and McKeen, 1990). Van de Ven (1974) noted the same effect in his comparison of group decision-making techniques. He attributed this effect to the degree of structure present in the session in relation to the degree of structure with which the group was comfortable. But of course the structure imposed is the primary factor in better group performance. This bears further exploration. But first I will tie together the above disciplinary frames. Then I will return to this phenomenon of dissatisfaction.

3. AN INTEGRATIVE FRAMEWORK FOR STRATEGIC GSS DESIGN

There is no doubt that developers have been influenced by the management science school of thought. The development of executive support systems and strategic-level decision support systems as extensions to management information systems is just one example of this. This approach is an attempt by the developers to bring a more rational, comprehensive approach to the strategy formation process. Through aggregation of transactional data, they try to compensate for the limited cognitive capacity of managers, providing an extension of their memory. But this method ignores the reality that decision makers are following a logical, incremental approach (Fredrickson, 1984; Fredrickson and Mitchell, 1984).

Insight into the nature of a system to support top managers in their strategic decision making is given by Mintzberg (1973). He shows that managers seek primarily external information, which must be current ("*rapid* but not necessarily *right*" [p. 149].) The manager prefers "trigger" information. Such information matches the managers' penchant for the action-reaction mode of decision making that characterizes incrementalism. Because of the need for timeliness, the manager usually obtains this information verbally. Mintzberg believes that an information system can be designed to match the managerial functions of collecting intelligence, storing information, and disseminating information (1973, pp. 150-152). These are the primary informational roles of the manager in an organization (Mintzberg, 1973, pp. 65-75 and 148).

A number of application types have been proposed as systems to support this difficult area of strategic planning and decision making. Most make use of some form of expert system technology to deal with "fuzzy" issues and qualitative information. Three types of so-called management support systems are in popular use: database systems, DSS, and executive support systems (ESS) (Iyer & Schkade, 1987). Database systems store and retrieve information, allowing sophisticated searches for specific relations between various pieces of information. As discussed above, DSSs are often model oriented, aimed at providing structure for problem solving.

ESSs are concerned with gathering and sorting data. An ESS performs passive scanning when executives receive unsolicited data, reactive scanning when looking for a solution to a specific problem, and proactive scanning when making a general search of the environment as a regular activity. Proactive scanning can be further broken down into coincidental scanning (non-habitual sources) and routine scanning (Iyer and Schkade, 1987).

These three types -- database, DSS, and ESS -- combined with advanced information technologies as described below, could directly support the strategic management function. When these three are integrated and supported by one, consistent interface, the result could be called a strategic

support system (Figure 2). Let us look at the four principle elements of this system.

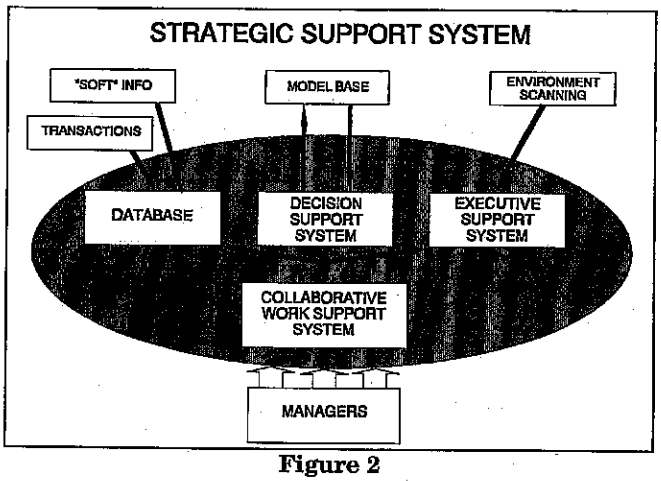

Figure 2

Design of the database system is a particularly intriguing problem. Management information systems have typically provided an extensive database of quantitative, routine, internal information that might well support middle managers in their job of controlling operations. But such a system does not answer the needs of top managers, who need tenuous, timely, external information (Mintzberg, 1973, pp. 195-196). As a result of the lack of a database tailored to such needs, managers have been forced to rely on personal contacts to glean information pertaining to the environment. This leads to what Mintzberg has called the "planning dilemma": managers have all the requisite information and flexibility to make strategic plans responsive to external phenomenon, but no time to focus on the issues and make use of the information. Their planners, on the other hand, have the computing power and time to consider the issues, but no information. To break this monopoly on strategically important information, a more flexible database system is needed.

This database would serve as a point of deposit for "soft" information gathered by executives in the course of their regular contacts, as well as information filtered up through the organization pertaining to internal performance based on transactions. With open entry and access to the database for all involved in strategic decision making, there would be more efficient sharing of full information across the entire organization. This repository of corporate intelligence could also guide executives in their search for additional information by pointing up gaps in knowledge as well as areas where an abundance of data already has been gathered.

The ESS provides another essential part of the system, as it collects and organizes information about the environment and industry to augment the database supporting the overall system. The proactive search could be at least partly automated, making use of electronically-based news and financial services to collect items of interest. Other inputs could come from manipulation of the "soft" data in the database. Information filtered by tactical level systems and deemed by mid-level executives to be significant enough for strategic level consideration could also be picked up by the ESS. Of course, it should also be recognized that top management is a source of information and thus part of the ESS through coincidental and reactive searches in the course of problem solving.

A DSS does not actually make a decision for the user, but rather supports the decision making process by modeling a specific situation, given a set of data about the situation. A DSS that effectively supports strategic planning would use a model base of macroeconomic, industry, corporate, and business unit models to help the decision makers understand the consequences of a given course of action. The set of data to input into the DSS would come from the database of "soft" and transactional data, plus the additional information gleaned from scanning by the executive support system. The areas where a DSS might be used are dependent on the nature of the problems to be solved. Traditionally, DSS have been used at the transactional (or operational) and tactical levels, where concrete outcomes can be estimated based on situational factors, inputs, and a course of action. Application of a DSS at the strategic level is somewhat problematic, since outcomes at this level (projected several years into the future) are not easily estimated.

DSSs can play an important part in a strategic support system by modeling those tactical factors of the environment, industry, and business that bear on the decision at hand. In combination, these factors carry a high level of uncertainty. The permutations possible with just a few tactical considerations can be intimidating. Executives react to the large number of permutations by ignoring them -- bounded rationality in action. This cannot help but yield suboptimal results. Use of a DSS can help the decision maker overcome the overwhelming variations in projected events.

An important function of top management is self-assessment of the organization's strategic position, both in aspiration and actuality. By comparing the desired strategic posture with the current or projected situation, top management can judge whether the current strategy is feasible, and what changes might be required to support a new strategy. This type of decision must be made both for wholly new strategies and for "mid-course corrections" in existing strategies (Lindblom, 1965; Quinn, 1980). By using a DSS to model a projected situation, management can gain a better understanding of the viability of a given strategy. In this way, a flexible system as described above affords support for logical, incremental decision making.

A DSS backed by a fairly complete database and ESS can greatly enhance strategic decision making capability. But these tools are of little use without good user interfaces at the individual and group levels.

Thus, the final ingredient for the "compleat" strategic support system is a collaborative work support system to tie the organization together as an information network and decision-making group (Huber, 1984b; Wynne and Heminger, 1989). Huber stresses that a general-purpose group system should focus on the sharing of both "soft" and "hard" information, while providing intraorganizational public and private communications capabilities. He predicts that through the use of such a system, the number of people participating in decision making *as information sources* will increase, while the number of people required to actually *make* a decision will be reduced (Huber, 1990).

Thus, a collaborative work support environment should lead to better and more efficient decision making.

Rudimentary collaborative work support includes such technologies as electronic mail, voice mail, and teleconferencing. A more sophisticated application is the electronic meeting system (Wynne and Heminger, 1989). A promising application of new technology to a collaborative work support system is hyperintelligence (Carlson and Ram, 1990). Previous research on group systems has concentrated on supporting decision-making in three ways: same place, same time; different place, same time; and same place, different time (Wynne, 1989). Carlson and Ram propose the hyperintelligence system as a means to support a decision making group in different places at different times. This makes maximum use of the power of information technology to bridge temporal and spatial gaps (Child, 1988). This type of collaborative work system has obvious advantages for a top management team with separate schedule demands that seriously hamper effective face-to-face meetings for the purpose of making strategic decisions.

In summary, in the past attempts have been made to fit strategic decision making into a rational, synoptic mold. This was done so that extensions of the management information systems base could be extrapolated to support top management. In the foregoing discussion, I have shown that this approach is not consistent with the reality of a logical, incremental approach to strategic planning and decision making. A strategic support system can be designed to enhance decision making by top management. Such a system must combine a database subsystem and an environmental scanning subsystem, both supporting a sophisticated modeling subsystem to bring the power of information technology to bear on the analysis of available information. Top managers would utilize a hypertext-style collaborative work support system to tie into these subsystems for needed information. This hyperintelligence interface would enable them to make strategic decisions despite handicaps in time and space. By allowing cycling through the process of problem structuring and problem solving, such a system would more closely parallel the activities of managers. Rather than trying to rationalize the specific tasks of managers, the system would parallel and support normal human behavior. In this way, the system can support the logical incremental approach to the strategy formation process.

4. RESEARCH ISSUES

Consideration of a design for a strategic support system as outlined above gives rise to a number of issues for further research. In the following paragraphs, a few of these are discussed and some research questions are formulated. This discussion is by no means exhaustive, but is meant to be suggestive of readily researchable issues.

4.1 Issue 1: Power

Power can be defined as the capability to exert influence. The act of making a decision is an opportunity to assert actual power or to cause a perception of power in the hands of the decision maker (Schmidt, 1992). It is common wisdom that power over a particular activity in an organization tends to concentrate at a level where complete information to support the activity is available (Lawrence and Lorsch, 1967; Mintzberg, 1983). This is especially true for decision making; in fact, one of the maxims of management is to push decision making down to the lowest level at which sufficient information is available to make the decision (Lawrence and Lorsch, 1967). In the case of a strategic support system as described in this paper, it would be a technically simple matter to make full information available at any or all levels of management within the organization. What effect would such a measure have on organizational power?

> **Proposition 1**: As the availability of information is spread across echelons of the organization, decision-making power is diffused along with the information.

A major problem to be tackled in order to pursue this research question is one of measurement of information availability and power. Precise operational definitions of these two variables would need to be made such that either a quantitative measurement of each could be made or qualitative judgments acceptable to disinterested parties could be established.

4.2 Issue 2: Communication and Organization Structure

Extensive, but generally inconclusive, research has been conducted on the use of organization-wide electronic communication systems (Culnan and Markus, 1987). There is some support for the contention that such systems bring about organizational change, but no resolution of the effects of electronic media has been achieved. DeSanctis and Gallupe (1987) see the primary role of GSS as altering the communication process within a group. If we subscribe to Mintzberg's (1983) view that patterns of communication are indicative of organizational structure and power (either formal or informal), then a change in the communication process would be synonymous with a change in the organizational structure (Culnan and Markus, 1987). Mintzberg (1979) visualizes a continuum of organizations from a rigidly centralized "simple structure" form to a "pure market" form where each organizational member accepts bids for their time and effort. He hypothesizes that as the organization becomes more decentralized and power becomes more diffused, an automated system would be needed to enable free lateral communication in support of decision making (1979, p. 266). So here there are two alternative views of information technology. From one side, the introduction of technology causes a change in the organization. On the other hand, the change in the organization precipitates the demand for the introduction of new information technology.

> **Proposition 2**: In organizations where decision making is more diffused, communication across formal boundaries through information technology will be more common.

A study of the causality issue will require a longitudinal study of organizations before and after the introduction of a strategic support system as described in this paper. In such a study, careful attention must be paid to the precise motives in choosing the installation of such a system. Did organizational pressures cause the choice, did top manage-

ment want to cause a change in the organization at the time of the introduction of the system, or was it adopted as "the latest thing to do?" If the last case is true, then a study can be made as to whether unintended changes in the organization occur as a result of the adoption of the new system.

Much has been published about employing information technology in support of strategic aims; but, the possible impact on organization structure has not been considered in detail. Piecemeal adoption of a new technology without consideration of the firm's current structure and environment could lead to undesirable consequences. At best, there will be considerable inefficiency in the use of the new technology. At worst, management could be forced into an untenable position. At this point little is understood about the nature of the impending organizational changes that might come from adoption of a new information system.

A separate issue in this regard is the fit of the information system to the organization (Markus and Robey, 1983; Schmidt, 1992). Most research projects on GSS have used ad hoc groups with no organizational history or context. But in those situations where the group does have an organizational identity, the mismatch between the way the group normally goes about making a decision and the way in which the GSS imposes a new decision-making method on the group could be the cause of a general feeling of dissatisfaction (e.g., the results of Gallupe and McKeen, 1990). This phenomenon merits more intensive and well-controlled study in a carefully selected organizational context.

> **Proposition 3**: Forced use of a support system that does not agree with traditional organizational decision making methods will produce dissatisfaction with the system despite improved decision making performance.

Of course, this is only one possible outcome of a mismatch. In fact, the definition of a mismatch in this context is only one dimension of the concept of a mismatch at the organizational level (Schmidt, 1992). For example, what if support for Proposition 2 were found? Then we might expect problems to crop up in organizations that diffuse decision making but adopt information technology that hinders communication across formal boundaries.

4.3 Issue 3: The Inseparable Process

It has been convenient for researchers to separate the problem-solving/decision-making process from the implementation of the chosen solution in order to isolate these phenomenon for study. However, empirical research supports the idea that these two processes are inseparable. A thorough treatment of the strategy process must consider strategy formation and strategy implementation to be intertwined (Huff and Reger, 1987; Mintzberg, et al., 1976; Quinn, 1980). The logical, incremental approach to strategy formation is an acute example of the concurrency of planning and implementation..

Thus another research challenge is to carefully examine the support of the strategic decision-making process. We need a better understanding of the type of information system applications which best support the process. The strategic support system as described above is a good start toward such support, but at this point it is merely one opinion.

> **Proposition 4**: As the design of a strategic support system more closely parallels the logical, incremental activities of strategic decision makers, the quality of strategic decisions will improve.

It remains to be shown that such a system would indeed be the best approach. Drawing on recent works in the field of decision making, such as Smith's (1988) insightful exploration of a problem-solving paradigm for management science, researchers may be able to better understand the thought processes which pervade strategic planning. In this way, we can be better equipped to decide the best approach to strategic support systems design. Experimentation or direct observation of top management in action during the strategic planning process may be viable approaches to increasing understanding of what generic types of information and what forms of information would best provide the support required. One problem with this area of research will be measuring the dependent variable, the quality of strategic decisions made. In Mintzberg's (1978) view this is the essence of strategy.

5. CONCLUSION

In this paper, I have described how the "management information systems" approach to support of top management in the strategic decision making process seems to have failed in its mission. The reason for the failure is the attempt to impose a rational, comprehensive approach on a basically logical, incremental process. The strategic support system as outlined in this paper should more closely fit the activities of managers. It makes use of a hypertext-style interface to a database subsystem, an environmental scanning subsystem, and a sophisticated modeling subsystem. Through an organic collaborative work support system that affords temporal and spatial flexibility, managers can cooperatively utilize the various subsystems to make periodic strategic assessments. The system is not unstructured. But unlike the management science-based approach of trying to rationalize managers' specific tasks, the system attempts to match the logical, incremental approach to the strategy formation process.

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REFERENCES

Attewell, P., and J. Rule, "Computing and Organizations: What We Know and What We Don't Know," *Communications of the ACM* 27 (1984), 1184-1192.

Brehmer, B. "The Role of Judgment in Small-Group Conflict and Decision Making," in H. R. Arkes and K. R. Hammond (eds), *Judgment and Decision Making*. Cambridge: Cambridge University Press, 1986, 293-310.

Carlson, D. A., and S. Ram, "HyperIntelligence: The Next Frontier", *Communications of the ACM* 33 (1990), 311-321.

Child, J., "Information Technology, Organization, and the Response to Strategic Challenges," *California Management Review* 30 (1987), 33-50.

Culnan, M. J., and M. L. Markus, "Information Technologies," in F. M. Jablin, L. L. Putnam, K. H. Roberts, and L. W. Porter (eds.), *Handbook of Organizational Communication*. Newbury Park, CA: Sage Publications, 1987.

Cats-Baril, W. L., and G. P. Huber, "Decision Support Systems for Ill-Structured Problems: An Empirical Study," *Decision Sciences* 18 (1987), 350-372.

Dearden, J., "SMR Forum: Will the Computer Change the Job of Top Management?" *Sloan Management Review* 25 (1983), 57-60.

DeSanctis, G., and R. B. Gallupe, "A Foundation for the Study of Group Decision Support Systems," *Management Science* 33 (1987), 589-609.

DeSanctis, G., M. J. D'Onofrio, V. Sambamurthy, and M. S. Poole, "Comprehensiveness and Restrictiveness in Group Decision Heuristics: Effects of Computer Support on Consensus Decision Making," *Proceedings of the Tenth International Conference on Information Systems*, Boston, MA, December 1989, 131-140.

Drucker, P. F., "The Coming of the New Organization", *Harvard Business Review* 66 (1988), 45-53.

Fredrickson, J. W., "The Comprehensiveness of Strategic Decision Processes: Extension, Observations, Future Directions," *Academy of Management Journal* 27 (1984), 445-466.

Fredrickson, J. W., and T. R. Mitchell, "Strategic Decision Processes: Comprehensiveness and Performance in an Industry with an Unstable Environment," *Academy of Management Journal* 27 (1984), 399-423.

Gallupe, R. B., G. DeSanctis, and G. W. Dickson, "Computer-Based Support for Group Problem-Finding: An Experimental Investigation," *MIS Quarterly* 12 (1988), 277-296.

Gallupe, R. B., and J. D. McKeen, "Enhancing Computer-Mediated Communication: An Experimental Investigation into the Use of a Group Decision Support System for Face-to-Face Versus Remote Meetings," *Information and Management* 18 (1990), 1-13.

Hammond, K. R., T. R. Stewart, B. Brehmer, and D. O. Steinmann, "Social Judgment Theory," in H. R. Arkes and K. R. Hammond (eds.), *Judgment and Decision Making*. Cambridge: Cambridge University Press, 1986, 56-76.

Henderson, J. C. "Finding Synergy Between Decision Support Systems and Expert Systems Research," *Decision Sciences* 18 (1987), 333-349.

Houdeshel, G., and H. J. Watson, "The Management Information and Decision Support (MIDS) System at Lockheed-Georgia," *MIS Quarterly* 11 (1987), 127-140.

Huber, G. P., "The Nature and Design of Post-industrial Organizations," *Management Science* 30 (1984a), 928-951.

_____, "Issues in the Design of Group Decision Support Systems," *MIS Quarterly* 8 (1984b), 195-204.

_____, "A Theory of the Effects of Advanced Information Technologies on Organizational Design, Intelligence, and Decision Making," *Academy of Management Review* 15 (1990), 47-71.

Huber, G. P., and R. R. McDaniel, "The Decision-Making Paradigm of Organizational Design," *Management Science* 32 (1986), 572-589.

Huff, A. S., and R. K. Reger, "A Review of Strategic Process Research," *Journal of Management* 13 (1987), 211-236.

Iyer, R. K., and L. L. Schkade, "Management Support Systems for Multinational Business," *Information & Management* 12 (1987), 59-64.

Johnson, G., "Rethinking Incrementalism," *Strategic Management Journal* 9 (1988), 75-91.

Katz, D., and R. L. Kahn, *The Social Psychology of Organizations*. New York: Wiley, 1978.

Klatzky, S. R., "Automation, Size, and Locus of Decision Making," *Journal of Business* 43 (1970), 141-151.

Lawrence, P. R., and J W. Lorsch, *Organization and Environment*. Homewood, IL: Irwin, 1967.

Leavitt, H., and T. Whisler, "Management in the 1980s," *Harvard Business Review* 36 (1958), 41-48.

Lindblom, C. E., *The Intelligence of Democracy: Decision Making Through Mutual Adjustment*. New York, NY: Free Press, 1965.

Markus, M. L., and D. Robey, "The Organizational Validity of Management Information Systems," *Human Relations* 36 (1983), 203-226.

Mintzberg, H., *The Nature of Managerial Work*. New York: Harper & Row, 1973.

_____, "Patterns in Strategy Formulation," *Management Science* 24 (1978), 934-948.

_____, *The Structuring of Organizations*. Englewood Cliffs, NJ: Prentice- Hall, 1979.

_____, *Power In and Around Organizations*. Englewood Cliffs, NJ: Prentice-Hall, 1983.

Mintzberg, H., D. Raisinghani, and A. Theoret, "The Structure of 'Unstructured' Decision Processes," *Administrative Science Quarterly* 21 (1976), 246-278.

Payne, J. W., "Contingent Decision Behavior," *Psychological Bulletin* 92 (1982), 382-402.

Quinn, J. B., *Strategies for Change: Logical Incrementalism*, Homewood, IL: Irwin, 1980.

Rockart, J. F., and D. W. DeLong, *Executive Support Systems: The Emergence of Top Management Computer Use.* Homewood, IL: Dow-Jones Irwin, 1988.

Schmidt, R. C., "Leadership Patterns and Information Technology Usage Patterns in Top Management Teams," Ph.D. dissertation, Indiana University, 1992.

Schwenk, C. R., "Cognitive Simplification Processes in Strategic Decision Making," *Strategic Management Journal* 5 (1984), 111-128.

Shrivastava, P., and J. H. Grant, "Empirically Derived Models of Strategic Decision Making," *Strategic Management Journal* 6 (1985), 97-113.

Simon, H. A., *Administrative Behavior* (3rd ed.) New York, NY: The Free Press, 1976.

Smith, G. F. "Towards a Heuristic Theory of Problem Structuring," *Management Science* 34 (1988), 1489-1506.

Wallace, R. E., "Beyond Transactional Systems," *Journal of Information Systems Management* 6 (1989), 65-67.

Wildavsky, A., "Information as an organizational problem," *Journal of Management Studies* 20 (1983), 29-40.

Wynne, B. E., "Groupware and Your Future," *American Management Association Information Management Forum,* November 1989, 1-3.

_____, "GDSS Environments -- Applications and Evolutions," *Proceedings of the 1990 Conference of the International Society for Decision Support Systems,* Austin, TX, September 1990.

Wynne, B. E., and A. R. Heminger, "Electronically Supported Communities: Reflections and Speculations," *Proceedings of the 23rd Annual Hawaii International Conference on System Sciences,* Manoa, HI, January 1990.

Van de Ven, A. H., *Group Decision Making and Effectiveness: An Experimental Study,* Kent State University, OH: Comparative Administration Research Institute, 1974.